ADLINK
LEADING EDGE COMPUTING

Computer-on-Modules Boost Improvements in Ultrasound Technology

Increased processing power and graphics performance in small form factor modules drive imaging advances and increased mobility in ultrasound devices.

Among the most valuable developments in today's medical technology is the new generation of ultrasound imaging devices. Improving medical ultrasound image quality has long been a priority for technologists whose goal is enabling more accurate diagnosis through more detailed visualization.

New advances in sensor technology and image processing include devices that generate 3D images that approach the detail and resolution of magnetic resonance imaging (MRI), enabling doctors to distinguish between malignant and benign tumors, for example. Fully portable, wireless-enabled ultrasound stations have come online that make it possible for ultrasound devices to move out of the hospital and into home-care telehealth systems.

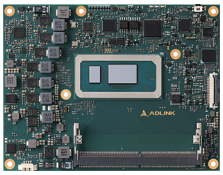
COM-HPC	COM Express®	
		
COM-HPC-cRLS	**Express-RLP**	**nanoX-EL**
Client Type COM-HPC Size C Module with 13th Gen Intel® Core™ Desktop Processor (formerly codename: Raptor Lake-S)	COM Express Rev. 3.1 Basic Size Type 6 Module with 13th Gen Intel® Core™ Mobile Processor (formerly codename: Raptor Lake-P)	COM Express Mini Size Type 10 Module with Intel Atom® x6000 Processors (formerly codename: Elkhart Lake)

Figure 1: ADLINK offers a large selection of open standard COM-HPC and COM Express products in the most widely applied form factors, including (left to right) the COM-HPC-cRLS, Express-RLP, and nanoX-EL modules. As a Titanium tier member of the Intel® Partner Alliance, ADLINK is in close collaboration with Intel in developing the latest technologies and ideally positioned to ensure its COM-HPC and COM Express solutions take full advantage of Intel's newest design enhancements.

These imaging advances have been made possible largely by the continuing development of high-performance central and graphics processing units (CPUs and GPUs). Yet simply ramping up processing power is not enough. Sophisticated software optimizations are also needed to help process raw sensor data and render images. An ultrasound device capable of producing clear, detailed images within a useful timeframe thus requires not only a great deal of processing power, but also carefully engineered software that takes maximum advantage of the system's hardware acceleration.

Quality, Mobility and Maintainability

While recent advances in computing power—particularly with respect to image processing—have resulted in greater potential for ultrasound solutions, the challenge that device manufacturers face is integrating these capabilities into a design that not only improves the image quality, but also improves the mobility and maintainability of the device.

Software Development and Optimization

Processing ultrasound data is computationally intensive, and with the increased variety of sensors and transducers in today's devices, the processing time needed to render advanced imagery has increased drastically. For instance, with a display resolution upgrade from 2K1K 60Hz to 4K2K 60Hz, graphical content is doubled. The processor must handle that 50% increase in content without an increase in processing time. Consequently, modern ultrasound stations make extensive use of software optimization to maximize processors' advantages.

Low Power Profile

Point-of-care ultrasound stations are increasingly mobile and must be sealed against moisture and dust, both to make them easy to sterilize and to protect their internal components. These requirements further push devices to apply mobile power sources and passive cooling designs, which in turn demand the lowest possible power and heat profiles, making low power consumption and thermal design power (TDP) a top priority.

Extensive I/O Options

For the sake of compatibility, processing speed, and ease of development, the bandwidth and stability of input/output channels available is a key consideration. Whereas two years ago an application might only require 3Gb/s SATA, today's technology improvements can double bandwidth requirements to 6 Gb/s SATA. In addition, communication between host (e.g., CPU) and client (e.g., sensor or transducer) requires a stable for continuous data transfer.

COM-HPC and COM Express Modules: Full Functionality and Wide Range

Seeking a wide variety of application-specific functions in an assortment power, heat, and processing profiles, embedded system developers are increasingly turning to high-performance COM-HPC or COM Express modules to supply the computing core of their systems. For ultrasound imaging products, COM-based solutions offer the full power of PC functionality in compact, standardized modules.

Ultrasound device manufacturers need an open standard COM-HPC or COM Express solution in form factors that provide ample I/O options while allowing the quick and effective application of the processing, thermal, and graphical advances of today's CPUs and GPUs. The minimum I/O demand for such an application would include PCIex16, which can be used to insert an external GPU card; at least four PCIe lanes to connect to the FPGA on the carrier board or Wi-Fi+Bluetooth card; Gigabit Ethernet to send data between computers; two SATA for storage; and four USB ports to connect to a touch screen, keyboard and mouse and/or USB stick. One company collaborating with Intel® to offer computer-on-modules that make efficient use of Intel's product advancements is ADLINK.

ADLINK's COM-HPC® and COM Express® boards feature high-performance Intel® processors with chipsets that support up to four independent, high-definition displays; up to 128 GB of memory and PCI Express expansion as well as a full array of I/O interfaces including SATA, USB, and Gigabit Ethernet. ADLINK's computer-on-modules provide the computational and graphics processing capabilities to perform the data collation and image rendering required by next generation ultrasound devices. In addition, ADLINK offers TPD adjustment on BIOS set-up, allowing customer to get balance on power consumption (mobility) and performance. In such case designers can focus on their core competencies when they choose a COM-based development platform, as this approach makes high performance computing possible without the need to investing the time and resources into designing a single board computer.

A modular COM-based solution with a custom carrier board offers several key advantages. COM carrier boards:

- Feature a variety of external I/O interfaces and configurations and are not limited to traditional connectors
- Can contain value-added silicon such as FPGAs or other types of peripherals; by placing these devices on the carrier board, the need for PCI Express or PCI expansion slots can be eliminated
- Uncouple the CPU from the I/O, so different processors may be used according to the application. CPUs may range from Intel® Atom™ based chips to Intel® Core™ i9
- Save the manufacturer valuable time on the design and maintenance of the core computing module
- Provide compatibility with a wide variety of peripherals

ADLINK offers a large selection of both COM-HPC and COM Express products in the most widely applied form factors.

COM-HPC® Modules

COM-HPC is the new open standard introduced by PICMG to complement COM Express in response to the ever-evolving digital transformation. Providing standards for two module types – Server Type and Client Type – COM-HPC offers substantially higher data bandwidths for delivering superior I/O performance while featuring high-performance computing and high-speed transmission with limitless scalability. Targeting visual-oriented applications, such as medical imaging, COM-HPC Client Type modules provide system integrators with up to four video displays, PCIe Gen5 and USB4 signaling, dual Ethernet, all compacted in a modest size utilizing SO-DIMMs or soldered onboard memory.

COM Express® Modules

ADLINK COM Express modules are available in three different sizes, each built around the x86 architecture. The current COM Express specification, COM.0 Rev. 3.1, includes advanced I/O support for USB4 and PCIe Gen 4 signaling, as well as DisplayPort, HDMI/DVI and eDP video interface.

Providing both legacy and current serial interfaces, COM Express modules are the ideal form factor for industry standard mobile ultrasound stations. The modules offer ample processing power and graphics capabilities, making them well suited for the large, static smart panels deployed in operating and examination rooms. Finally, the Mini size Type 10 module at 84 x 55 mm is small enough to be used for hand-held solutions, giving doctors highly mobile tool they can carry with them for bedside patient visits.

High Definition Video Enables the Digital Operating Room

Powerful, real-time images enable better and more informed treatment decisions during medical procedures such as X-ray, ultrasound and endoscopy. Contemporary operating room (OR) environments incorporate high-resolution video technology that delivers these highly detailed, low-latency video images. Critical video data may come from a range of devices presenting data in different formats such as DVI, CVBS and RGB, requiring fast and efficient normalization of the various formats. Digital OR systems not only integrate the varied video inputs and displays, but also record the collected data for future reference.

Enhancing Care with Efficient Mobile Nursing Workstations

Mobile nursing workstations bring care and safety directly to patients. They enable efficient, personalized care in any setting required by a busy clinical environment. Care providers can view electronic medical records (EMR), medication data and administrative documents, as well as enter data and connect to data centers for real-time information sharing. ADLINK's COM Express modules enable these portable workstations, incorporating multiple types of data entry interfaces and remote diagnosis capabilities. The resulting improved workflow minimizes time spent on patient administration. Integrated functionality such as wireless connectivity and secure access to patient records dramatically increases the level of patient care.

intel partner Titanium

The ADLINK Advantage

As a Titanium member of the Intel® Partner Alliance (IPA), ADLINK is in close collaboration with Intel in developing the latest technologies and ideally positioned to ensure its COM-HPC and COM Express solution take full advantage of Intel's newest design enhancements.

ADLINK's custom carrier board design teams provide embedded developers with a quick and cost-effective alternative to full custom development of the core computing system. Our experienced engineers enable developers to get their product to market in the most timely and efficient manner possible. From design concept to schematic, from layout to working prototype, our teams guide customers through the entire design process, helping them avoid common pitfalls along the way. Custom BIOS and software services are also available from our experienced in-house specialists. Finally, for developers who wish to design their own carrier boards, ADLINK provides full design support, with all schematics and a comprehensive design review.

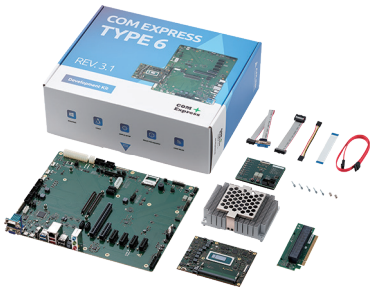
I-Pi Development Kits

ADLINK's I-Pi is an industrial IoT prototyping platform that combines production-grade components, extreme software portability, and Raspberry Pi-like flexibility and expansion in a COM form factor. ADLINK offers various out-of-the-box-ready development kits for developing, referencing, and prototyping your tailored, Intel-driven medical applications.

COM-HPC Client Type Raptor Lake-S

Intel® 13th Gen Core™ Desktop Processor

Learn More



COM Express Type 6 Raptor Lake-P

Intel® 13th Gen Core™ Mobile Processor

Learn More

COM Express Type 10 Elkhart Lake

Intel® 6th Gen. Atom® Processor

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